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Differences in Food Spending on Groceries and Eating Out Between Two Dietary Groups: The NEW Soul Study

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DIFFERENCES IN FOOD SPENDING ON GROCERIES AND EATING OUT BETWEEN TWO DIETARY GROUPS: THE NEW SOUL STUDY

By

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Thesis Summary

Background: Heart disease is now the leading cause of death for both men and women in the United States. Obesity, high blood pressure, and high cholesterol are all risk factors for heart disease. Research has shown that increasing consumption of plant-based foods may be effective in reducing risk factors for chronic disease, especially heart disease. A plant-based diet consists of nutrient-dense plant foods and minimizes the consumption of processed animal products. High costs of eating a healthier diet are a commonly cited barrier that prevents individuals from making dietary changes that could potentially decrease their chronic disease risk.

Objective: To investigate the differences in spending on groceries and spending on eating out between two groups of participants randomly assigned to a vegan diet group or a low-fat omnivorous diet group.

Design: 12-month randomized intervention

Methods: A total of 67 African American adults with overweight or obesity were recruited to participate in a 24-month nutrition intervention (The NEW Soul Study) as a part of cohort 1 (analyzed for this study). The participants were randomized to either a vegan diet or a low-fat omnivorous diet in a 2-year dietary intervention. At baseline, 34 participants were in the low-fat omni group and 33 in the vegan group. The intervention consisted of weekly classes for the first six months, bi-weekly for the next six months, and monthly classes for the last 12 months. Data collected from psychosocial questionnaires administered to participants from cohort 1 at baseline and 6-months were analyzed to assess 1) differences in food spending on groceries between the two groups 2) differences in food spending on eating out between the two groups. Overall

changes in spending from baseline to 6-months collected from the first cohort (N=67) were analyzed and compared between the two groups.

Results: The vegan group increased their grocery spending less (+$9.59) than the omni group (+$26.04) from baseline to 6-months. The vegan group decreased their weekly eating out costs (-$18.24) more than the omni group (-$12.54) from baseline to 6-months. Although there were differences in spending between the two groups, none of the results were statistically significant.

Conclusion: The hypothesis that both dietary groups would have decreased spending on groceries and eating out from baseline to 6-months, and that the vegan group would have decreased their spending more than the omni group, was not confirmed due to the lack of statistically significant results.

Conflict of Interest: None

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I. Literature Review

Introduction:

According to the World Health Organization (WHO), obesity rates have tripled since 1975 and having overweight or obesity is now linked to 2.8 million deaths worldwide (WHO, 2017). The WHO outlines that the recommendation for a healthy diet includes fruits, vegetables, nuts, legumes, and whole grains (WHO, 2018). The largest health organization in the world recommends this type of diet, yet it does not mention meat or any animal products. So why are Americans still consuming a diet full of meat and animal products? Why are vegan and vegetarian diets considered so out of the ordinary in our society? This literature review will examine the evidence-based research that exists on the benefits of a plant-based diet, past studies focusing on the success of dietary interventions, and the costs, both individual and economic, of consuming a healthier diet.

According to *The Journal of Geriatric Cardiology*, plant-based diets consist "of all minimally processed fruits, vegetables, whole grains, legumes, nuts and seeds, herbs, and spices and excludes all animal products, including red meat, poultry, fish, eggs, and dairy products" (Ostfeld, 2017). There are certain specific essential nutrients that vegetarians get more of including fiber, folic acid, vitamins and minerals. Individuals following a plant-based diet tend to have lower body weight, lower blood pressure, and lower serum cholesterol overall (Craig, 2009). These health benefits can prevent chronic illness, and as a result vegetarians are at a lower risk for heart disease, stroke, and type 2 diabetes. (Craig, 2010).

A. Benefits of plant-based diets

Heart disease is the leading cause of death in the United States for men and women, with the second and third being stroke and diabetes (CDC, 2017). One of the major benefits of decreasing consumption of animal products and increasing consumption of plant-based foods is the reduced risk for chronic illnesses such as ischemic heart disease and stroke. Many studies have examined the protective effect of vegetarian diets against heart disease. For example, the EPIC-Oxford study is a prospective cohort study that examined the associations of a vegetarian diet with the risk of ischemic heart disease and stroke. The study followed 48,188 participants with no history of heart disease or stroke for eighteen years. The participants were organized into three diet groups: meat eaters, fish eaters, and vegetarians (including vegans). The study found that over the 18-year period, fish eaters and vegetarians had 13% and 22% lower risk respectively of developing ischemic heart disease than meat eaters (Tong et al., 2019).

One of the factors contributing to the decreased risk for certain chronic illnesses in vegetarians is lower blood pressure among individuals following a plant-based diet. According to a report from the American Heart Association, 7 out of every 10 people having their first heart attack and/or individuals with chronic heart failure have high blood pressure (Mozzafarian et al., 2015). A study published in *The Journal for Nurse Practitioners* examined cross-sectional, cohort, and case-studies comparing the prevalence of hypertension in vegetarians and non-vegetarians. The overall prevalence of hypertension was 33% lower among vegetarians than non-vegetarians (Garbett et al., 2016). This evidence demonstrates the protective effect of reducing the consumption of animal products against developing hypertension, one of the main risk factors for heart disease and stroke.

Another key mechanism through which plant-based diets can prevent heart disease is the potential for plant-based diets to lower cholesterol. Fiber plays an important role in mediating the effects of decreasing serum cholesterol by decreasing cholesterol and fat absorption and altering cholesterol synthesis in the body. A meta-analysis found that an increase of 2-10g of fiber per day led to a decrease in LDL cholesterol by .057 mmol/L. These cholesterol-lowering effects may be impacted by the low levels of saturated fats present in plant-based diets and the higher levels of unsaturated fats (Satija et al., 2018).

B. <u>Past studies focusing on success of a plant-based diet:</u>

There have been many large-scale and community-based studies focusing on the health effects of following a plant-based diet, specifically the impact on factors related to heart disease and diabetes. A study published in the *Journal of Diabetes and Nutrition* demonstrates the effectiveness of a plant-based diet in the treatment of obesity specifically. The 16-week randomized clinical trial tested the effect of a plant-based diet on body composition and insulin resistance. These two factors can contribute to a variety of chronic illnesses, including heart disease and diabetes. Participants with overweight were randomized into plant-based diet and control diet groups and observed over a period of 16 weeks. The plant-based diet group was asked to follow a low-fat vegan diet, avoid animal products and oils, and not exceed a daily fat intake of 20-30g. The control diet group was asked to maintain their current diet that included animal products. The results found that the plant-based vegan diet group improved body weight, fat mass, and insulin resistance more than the control diet group. This study provides evidence supporting the benefits of a plant-based diet for reducing risk factors, specifically overweight and obesity, for chronic illnesses (Kahleova et al., 2018).

A similar study published by *Nutrients* was aimed at determining beta-cell function in adults with obesity through a plant-based dietary intervention done over 16 weeks. There was an intervention group and a control group. The intervention group followed a low-fat vegan diet and the control group was asked to make no dietary changes. Adherence was monitored through dietary recalls at baseline and 16 weeks, as well as random telephone calls by study dieticians to assess adherence. Following the intervention, the intervention group showed significantly improved beta-cell function and insulin sensitivity. This is another intervention that demonstrates the benefits that a plant-based diet has on chronic disease risk factors, specifically insulin resistance (Kahleova et. al, 2018).

A study published in the *Journal of the American Heart Association* used data collected from a community-based cohort in four communities across the U.S. (Washington County, MD, Forsyth County, NC, Minneapolis, MN, and Jackson, MS) to assess the benefits of plant-based diets across a larger population. The population included 12,168 participants, male and female ages 45-65 at baseline, across all four locations. Data were collected from the Atherosclerosis Risk in Communities (ARIC) study which was performed from 1987 to 1989. In the years following, participants returned for follow-up visits in 1990 to 1992 (visit 2), 1993 to 1995 (visit 3), 1996 to 1998 (visit 4), 2011 to 2013 (visit 5), and 2016 to 2017 (visit 6). At baseline and visit 3, interviewers assessed participants' usual intake of foods and beverages using a modified version of the 66-item Willett food frequency questionnaire. Participants indicated the frequency with which they consumed foods and beverages of a certain serving size in the previous year. Established plant-based diet scores were then used to assess participants' adherence to plant-based diets according to their reported dietary intake on the food

frequency questionnaire in the ARIC study. The researchers found that a higher adherence to a healthy plant-based diet index was associated with a 19% lower risk of cardiovascular disease mortality. This study shows that higher adherence to a plant-based diet reduced the risk of chronic disease, specifically cardiovascular disease, and allows this finding to be applied outside of a controlled research study with narrow generalizability (Caulfield et al., 2019).

Research studies have previously shown that dietary interventions can improve risk factors for chronic disease, including diabetes control. However, these findings have been difficult to adapt to a non-research, clinical setting. A study published in the *Journal of the Academy of Nutrition and Dietetics* aimed to adapt the weekly nutrition class format from a research setting to the waiting room of an endocrinology practice to determine the efficacy of a vegan eating plan versus a portion-controlled eating plan in improving diabetes control. Participants attended weekly classes at an endocrinology practice and were assigned to either a vegan diet group that avoided added oils or a portion-controlled diet group that specified roughly a 500kcal deficit per day. The results found that body weight, HbA1c, and LDL cholesterol improved within each group. However, there were no significant differences between the two groups. This study can be used as an example of successful interventions in which a plant-based diet contributed meaningfully to improved chronic health risk factors and that a dietary intervention could be adapted to the clinical setting (Barnard et al., 2018).

C. Individual costs associated with eating a healthier diet

Although eating a diet containing more nutrient-dense, plant-based foods has been shown to reduce risk factors for several chronic diseases, a commonly cited barrier to making dietary changes remains the costs associated with buying healthier foods. A

systematic review aimed to evaluate existing research on the association between healthfulness of foods and price in order to address this concern. The review took careful consideration to compare healthfulness of foods based on food group, overall dietary pattern, and total calories consumed in order to find the most accurate cost comparisons between healthy and unhealthy foods. Interestingly, the largest price differences were found for meat options, with healthier meat options costing on average $.29 more per serving and $.47 more per 200 kcal than less healthy meat options. Price differences were much smaller for grains, dairy, snacks/sweets, and fats/oils. When comparing prices of food-based dietary patterns definitions of healthfulness varied, some including the Mediterranean dietary pattern, Alternative Healthy Eating Index, fruit and vegetable intake, and energy density. Healthier diets cost on average $1.48 more per day and $1.54 more per 2000 kcal than unhealthy diets. Researchers also noted that because healthier diets containing more nutrient-dense foods and fiber will have fewer calories overall and therefore cost more per kcal than higher calorie diet patterns (Rao et al., 2013).

Another study used 24-hour dietary recalls from the National Health and Nutrition Examination Survey (NHANES) to determine the daily mean cost of food categorized by food group. The study found that protein foods and mixed dishes to be the two most expensive food groups, accounting for roughly 45% of daily food cost, while grains, fruits, and vegetables accounted for only 18% of total costs. The study then examined percent daily intake and per unit cost of vitamins, minerals, calcium, vitamin D, potassium, and fiber to investigate potential substitutions of lower-cost food items that would successfully contribute to the overall nutritional value of the diet. The study recommended increasing the intake of chickpeas, quinoa, and sweet potatoes in the diet

would increase potassium and fiber intake at the lowest cost for the consumer. These foods are key ingredients in a plant-based diet and this suggestion supports the idea that plant-based diets can be a low-cost option for the consumer (Hess et al., 2019).

D. **Long-term costs associated with eating a healthier diet**

It is also important to consider the long-term economic benefits of a population consuming a healthier diet. A study published in the *American Journal of Health Promotion* examined the potential savings for society resulting from reduced salt consumption among U.S. adults. High sodium intake has been linked to hypertension, one of the leading contributors for chronic illnesses. The study found that by reducing sodium intake to 2300 mg per day, the number of cases of hypertension would be reduced by 11 million. This reduction in high blood pressure cases would save $18 billion health care dollars annually and would result in the gain of 312,000 quality of life years, worth 32 billion dollars annually (Palar et al., 2017).

Similarly, a cost-effectiveness analysis published in the *American Journal of Preventive Medicine* modeled the projected lifetime effects of a fruit and vegetable subsidy. The results suggested that nationwide Supplemental Nutrition Assistance Program Fruit/Vegetable subsidies would reduce chronic disease morbidity, mortality, and costs within the health care system over the long-term. The study also concluded that these long-term effects would be difficult to observe in short-term community-based trials that assess benefits of increasing plant foods at an individual level (Choi et al., 2017).

In conclusion, there are numerous health benefits associated with following a plant-based diet, there are costs associated with consuming a healthier diet, and there is evidence suggesting that improving dietary patterns could have a long-term societal

effect on reducing dollars spent on healthcare and increasing quality of life years for the general population. These conclusions have been drawn across multiple sectors of research, leading to the idea that there are many individual and societal benefits to finding a way to make plant-based foods more accessible and affordable in communities.

This thesis aims to investigate the differences in spending on groceries and spending on eating out between two groups of participants in cohort 1 of the NEW Soul Study randomly assigned to a vegan diet group or a low-fat omnivorous diet group. The research goal is to examine whether or not there are differences in food spending between the two groups and the changes from baseline to 6-months. I hypothesize that both dietary groups will have decreased spending on groceries and eating out from baseline to 6-months, and that the vegan group will have decreased their spending more than the omni group.

II. Methodology

The Nutritious Eating With Soul (NEW Soul) Study is a randomized behavioral intervention tailored to the African-American population in South Carolina. African American adults considered obese or overweight were randomized to one of two diets: 1) a whole foods, plant-based vegan diet or 2) a low-fat omnivorous diet. Participants were recruited from the community through advertising and were screened thoroughly. Eligible participants completed baseline screening. Data collected included survey-based data, dietary recalls, anthropometric data, and laboratory assessments. Once baseline screening was complete, participants were randomized to one of the two diet groups. There are two cohorts in the study, and they are separated by one year. Cohort 1

began the study in May 2018 and Cohort 2 began the study in June 2019. The primary goal of the NEW Soul Study is to examine differences in risk factors at 12 months for CVD (changes in lipids, glucose, insulin, and blood pressure) and body weight between participants randomized to the omni or vegan group. The secondary aim is to examine long-term changes in CVD risk factors at body weight at 24 months (17).

There are various components to the delivery of this intervention. The main intervention consists of weekly 75-minute in-person meetings for 6 months, followed by bi-weekly meetings for 6 months, followed by monthly meetings for 12 months. In addition to group classes, content is delivered remotely in the form of weekly emails, electronic copies of the class handouts, recipes, and notes from the study staff. If a participant misses class, they can complete a make-up class online complete with videos of the class slides and a brief quiz. Monthly lunch-and-learns are also offered for participants who want to make up their missed class in person. When the frequency of class meetings decreases to bi-weekly at 6 months, participants are provided with a Facebook group for their dietary group. This allows participants to connect virtually with each other as well as with study staff. When class meetings decrease to monthly at 12 months, participants receive a podcast or newsletter on the weeks they are not meeting face-to-face (Turner-McGrievy et al., 2019).

Cohort 1 completed psychosocial questionnaires at baseline (April – May 2018) and at 6-months (October – November 2018). Participants reported average weekly spending on groceries and eating out at restaurants at baseline and 6-months. Questions were identical at both timepoints. The questions used for analysis included (1) How much does your household spend on groceries each week? and (2) How much does your

household spend on eating out at restaurants each week? Participants reported their average weekly spending to the nearest whole dollar amount.

Data Analysis

The psychosocial questionnaire responses related to perceptions of food spending were analyzed. First, we compared unadjusted differences in average weekly spending on groceries and average weekly spending on eating out between the two dietary groups from baseline to 6-months. Second, we also compared differences in average weekly spending from baseline to 6-months after controlling for household characteristics of reported number of adults living in the house under 65, adults over 65, and children under 18 years of age. Significance was set a priori at $\alpha = 0.05$. All data were analyzed using SAS v.9.4.

III. Results

Data collected from questionnaires administered to participants from cohort 1 at baseline and 6-months were analyzed to assess 1) differences in food spending on groceries between the two groups 2) differences in food spending on eating out between the two groups. Overall changes in spending on groceries and spending on eating out from baseline to 6-months were analyzed and compared between the two dietary groups.

1.) Food Spending on Groceries at Baseline (Unadjusted)

The omni group reported spending a mean of $85.18 per week per household on groceries while the vegan group was spending a mean of $107.00 per week on groceries.

While there is a difference of $22.00 on grocery spending between the groups, this difference is not statistically significant. (t=-1.33, p=0.19).

Table 1. Differences in mean food spending on groceries between 2 diet groups at baseline

Group	Number of participants	Mean spending (in dollars) per household per week	Std. Dev.
Omni	34	$85.18	60.36
Vegan	32	$107.00	73.10

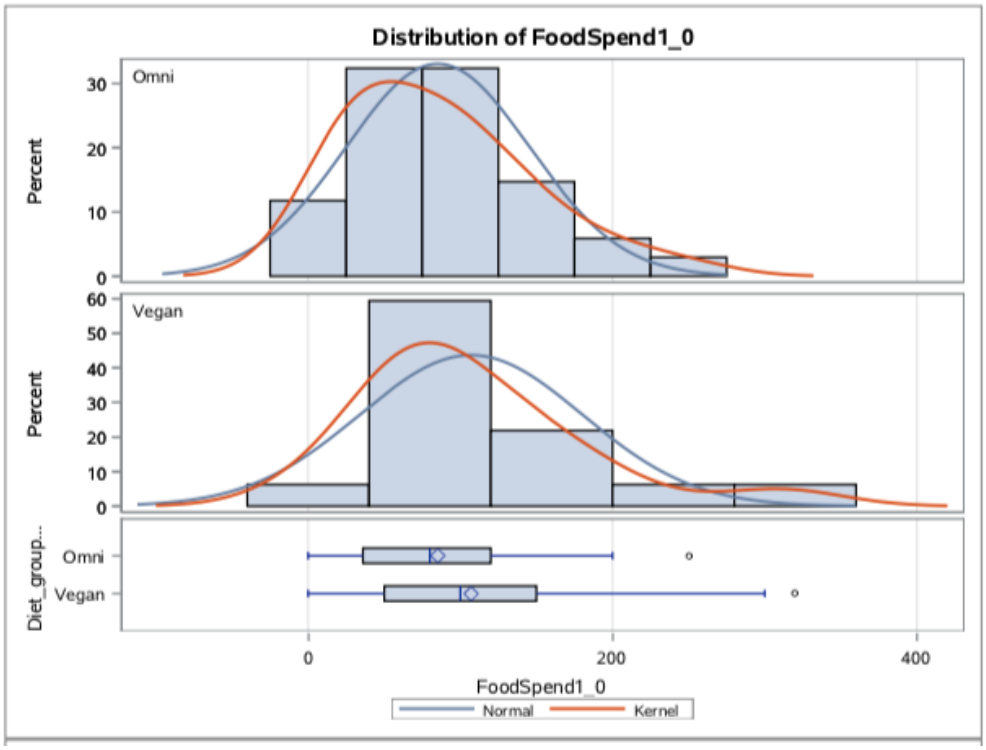

Figure 1. Distribution of mean food spending on groceries between 2 diet groups at baseline

2.) Food Spending on Eating Out at Baseline (Unadjusted)

The omni group reported spending a mean of $45.73 per week per household on eating out and the vegan group reported spending a mean of $66.93 per week per household on eating out at baseline. While there is a difference of $21.00 on eating out between the two groups, this difference is not statistically significant (p=0.09).

Table 2. Differences in mean food spending on eating out between 2 diet groups at baseline

Group	Number of participants	Mean spending (in dollars) per household per week	Std. Dev.
Omni	34	$45.74	33.19
Vegan	32	$66.94	65.29

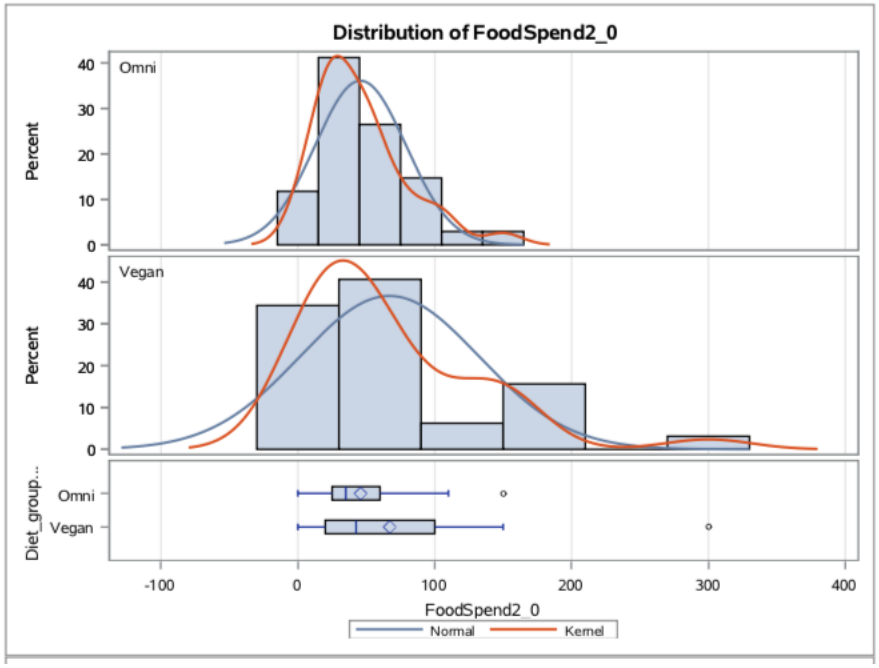

Figure 2. Distribution of mean food spending on eating out between 2 diet groups at baseline

3.) Food Spending on Groceries at 6-months (Unadjusted)

The omni group reported spending a mean of $97.22 on groceries and the vegan group reported spending a mean of $110.00 on groceries at 6-months. While there is a difference of $12.78 on grocery spending between the two groups, this difference is not statistically significant (p=0.57).

Table 3. Differences in mean food spending on groceries between 2 diet groups at 6-months

Group	Number of participants	Mean spending (in dollars) per household per week	Std. Dev.
Omni	27	$97.22	80.76
Vegan	22	$110.00	77.55

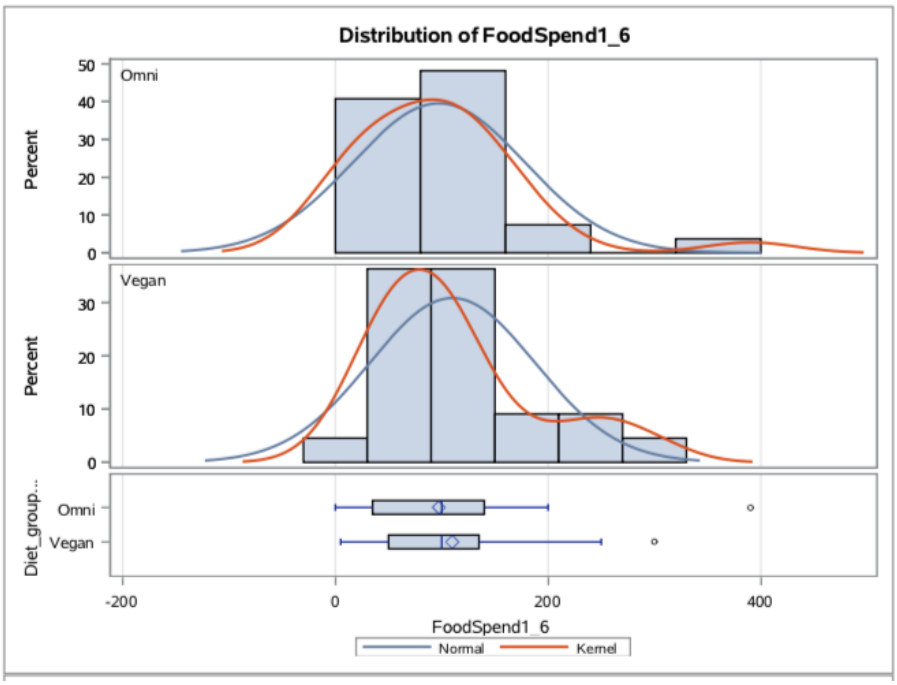

Figure 3. Distribution of mean food spending on groceries between 2 diet groups at 6-months

4.) Food Spending on Eating Out at 6-months (Unadjusted)

The omni group reported spending $29.51 and the vegan group reported spending $45.41 on eating out at 6-months. While there is a difference of $15.90 on eating out between the two groups, this difference is not statistically significant (p=0.15).

Table 4. Differences in food spending on eating out between 2 diet groups at 6-months

Group	Number of participants	Mean spending (in dollars) per household per week	Std. Dev.
Omni	27	$29.51	32.12
Vegan	22	$15.90	43.59

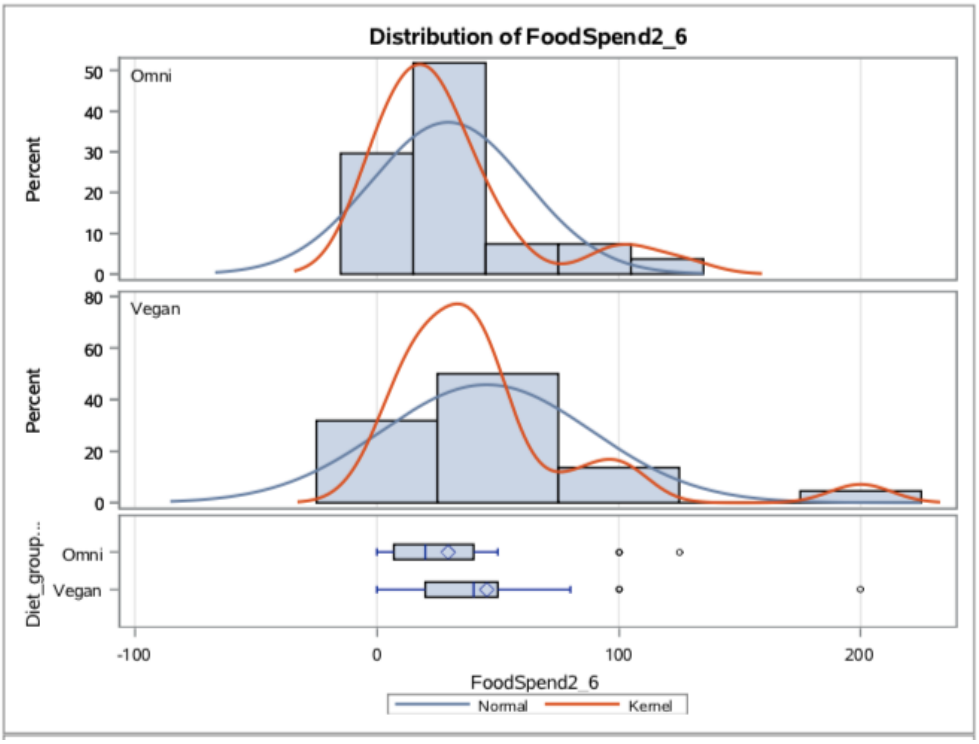

Figure 4. Distribution of food spending on eating out between 2 diet groups at 6-months

5.) Overall Changes in Spending on Groceries from Baseline to 6-months (Adjusted)

Table 5. Overall change in mean food spending on groceries from baseline to 6-months

Dietary Group	Mean Change in Food Spending (in dollars) per household
Omni	+$26.04
Vegan	+$9.58

From baseline to 6-months, the omni group increased their weekly grocery spending by $26.04 compared to vegans who increased their weekly grocery spending by $9.59 after adjusting for number of adults under 65, adults over 65, and children under 18 years of age living in the home. While the vegan group increased their weekly grocery spending by less than the omni group, the differences in weekly grocery spending are not significant. (p=0.45)

6.) Overall Changes in Spending on Eating Out from Baseline to 6-months (Adjusted)

Table 6. Overall changes in mean food spending on eating out from baseline to 6-months

Dietary Group	Mean Change in Food Spending (in dollars) per household
Omni	-$12.58
Vegan	-$18.24

The omni group decreased weekly eating out costs by $12.58 compared to the vegan group who decreased weekly eating out costs by $18.24 after adjusting for number of

adults under 65, adults over 65, and children under 18 years of age living in the home. While vegans decreased overall eating out costs more, the change with respect to the omni group was not significant (p=0.67).

IV. Discussion

The purpose of this thesis is to investigate the differences in spending on groceries and spending on eating out between two groups of participants in cohort 1 of the NEW Soul Study randomly assigned to a vegan diet group or a low-fat omnivorous diet group. Although differences in spending on groceries and eating out between the two dietary groups was not statistically significant, the changes in spending from baseline to 6-months merit further consideration. The vegan group increased their grocery spending less (+$9.59) than the omni group (+$26.04) from baseline to 6-months. Although this difference was not statistically significant, it is possible that the omni group was spending more on groceries due to the higher costs of healthier meat/protein options as seen in the literature. The vegan group would not encounter the high costs associated with buying leaner meats and low-fat cheese and dairy products, which is why they may have increased their spending on groceries less.

The vegan group also decreased their weekly eating out costs (-$18.24) more than the omni group (-$12.54) from baseline to 6-months. Although this change was not statistically significant, it is possible that this difference is due to the high cost of entrees that contain meat and dairy at restaurants as opposed to vegetarian/vegan options that may be less expensive. It is also possible that both groups decreased their spending on eating out throughout the study because they were focusing more on cooking meals at home instead of looking for restaurants that fit into their new dietary guidelines.

These findings suggest following a vegan diet can be an affordable option when compared to an omnivorous diet. It may be practical to inform participants in dietary interventions that they may see an increase in grocery spending but may see a decrease in spending on eating out, while continuing to emphasize the long-term benefits of making dietary changes. Future studies may wish to assess how changes in food spending for participants in dietary interventions may impact health outcomes, and how these health outcomes may lead to cost savings in other areas such as prescription medications.

One limitation of this study is that all of the data were collected from African Americans living in Columbia, South Carolina which may lead to narrow generalizability. Another limitation of this study is the use of self-report data from participants on their average weekly food spending. Future studies may wish to employ a more objective means of collecting food spending data, such as analyzing grocery receipts or using raw spending data rather than self-report questionnaires. The strengths of this study are that the data collection was cost-effective due to using data collected from existing surveys administered as a part of the NEW Soul Study.

V. Conclusions

I hypothesized that both dietary groups would have decreased spending on groceries and eating out from baseline to 6-months, and that the vegan group would have decreased their spending more than the omni group. My hypothesis was not confirmed due to the lack of statistically significant results.

References:

1. Barnard, N. D., Levin, S.M. Gloede, L. & Flores, R. (2018). Turning the waiting room into a classroom: weekly classes using a vegan or a portion-controlled eating plan improve diabetes control in a randomized translational study. *Journal of the Academy of Nutrition and Dietetics, 118*(6):1072-1079. Doi: 10.1016/j.jand.2017.11.017.

2. Craig, W. 2009. Health effects of vegan diets. *The American Journal of Clinical Nutrition, 89*(5), 1627-1633. https://doi.org/10.3945/ajcn.2009.26736N.

3. Craig, W. 2010. Nutrition Concerns and Health Effects of Vegetarian Diets. *Journal of Nutrition in Clinical Practice, 25(*6), 613-620. https://doi.org/10.1177/0884533610385707.

4. Choi, S., Seligman, H., & Basu, S. (2017). Cost Effectiveness of Subsidizing Fruit and Vegetable Purchases Through the Supplemental Nutrition Assistance Program. *American Journal of Preventive Medicine, 52*(5), 147-155. https://doi.org/10.1016/j.amepre.2016.12.013

5. Garbett, T., Garbett, D., Wendorf, A. (2016). Vegetarian Diet: A Prescription for High Blood Pressure? A Systematic Review of the Literature. *The Journal for Nurse Practitioners, 12*(7), 452-458. https://doi.org/10.1016/j.nurpra.2016.04.013

6. Hess, J. M., Cifelli, C. J., Agarwal, S., & Fulgoni, V.L. (2019). Comparing the cost of essential nutrients from different food souces in the American diet using NHANES 2011-2014. *Nutrition Journal, 18*(68). https://doi.org/10.1186/s12937-019-0496-5

7. Institute of Medicine (US) Committee on Diet and Health; Woteki CE, Thomas PR, editors. Eat for Life: The Food and Nutrition Board's Guide to Reducing Your Risk of Chronic Disease. Washington (DC): National Academies Press (US); 1992. Chapter 6, Fats, Cholesterol, And Chronic Diseases. Available from: https://www.ncbi.nlm.nih.gov/books/NBK235018/

8. Kahleova, H., Tura, A., Hill, M., Holubkov, R., & Barnard, N. (2018). A Plant-Based Dietary Intervention Improves Beta-Cell Function and Insulin Resistance in Overweight Adults: A 16-Week Randomized Clinical Trial. *Nutrients, 10*(2): 189. doi: 10.3390/nu10020189

9. Kahleova, H., Fleeman, R., Hlozkova, A., Holubkov, R., & Barnard, N. (2018). A plant-based diet in overweight individuals in a 16-week randomized clinical trial: metabolic benefits of plant protein. *Nutrition & Diabetes, 8*(58). doi: 10.1038/s41387-018-0067-4

10. Kim, H., Caulfield, L., Garcia-Larsen, V., Steffen, L.M., Coresh, J., & Rebholz, C.M. (2019). Plant-based diets are associated with a lower risk of incident cardiovascular disease, cardiovascular disease mortality, and all-cause mortality in a general population

of middle-aged adults. *Journal of the American Heart Association, 8*(16). https://doi.org/10.1161/JAHA.119.012865

11. Leading Causes of Death. (2017). Centers for Disease Control and Prevention. Retrieved from https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm

12. Mozzafarian D., Benjamin, E.J., Go, A.S, et al. (2015). Heart Disease and Stroke Statistics-2015 Update: a report from the American Heart Association. *Circulation*, *131*(4), 29-322. https://doi.org/10.1161/CIR.0000000000000152

13. Ostfeld, R. (2017). Definition of a plant-based diet and overview of this special issue. *Journal of Geriatric Cardiology, 14*(5), 315. Doi: 10.11909/j.issn.1671-5411.2017.05.008

14. Palar K, Sturm R. Potential societal savings from reduced sodium consumption in the U.S. adult population. *Am J Health Promot*. 2009;24:49–57.

15. Rao, M., Afshin, A., Sing, G., & Mozaffarian, D. (2013). Do healthier foods and diet patterns cost more than less health options? A systematic review and meta-analysis. *BMJ Open, 3*(12). doi: 10.1136/bmjopen-2013-004277

16. Satija, A. & Hu, F.B. (2018). Plant-based diets and cardiovascular health. *Trends Cardiovasc Med, 28*(7), 437-441. doi:10.1016/j.tcm.2018.02.004.

17. Tong, T., Bradbury, K., Travis, R., & Key, T. (2019). Risks of ischaemic heart disease and stroke in meat eaters, fish eaters, and vegetarians over 18 years of follow-up: results from the prospective EPIC-Oxford study. British Medical Journal, 366(14897).doi: 10.1136/bmj.l4897

18. Turner-McGrievy, G., Wilcox, S. Frongillo, E.A., Murphy, A., Hutto, B., Williams, K., Crimarco, A. Wilson, M., & Davey, M. (2019). The Nutritious Eating with Soul (NEW Soul) Study: Study design and methods of a two-year randomized trial comparing culturally adapted soul food vegan vs. omnivorous diets among African American adults at risk for heart disease. *Contemporary Clinical Trials, 88*. https://doi.org/10.1016/j.cct.2019.105897

19. World Health Organization. (2017). *10 facts on obesity*. Retrieved from: https://www.who.int/features/factfiles/obesity/en/.

20. World Health Organization. (2018). *Healthy Diet*. Retrieved from https://www.who.int/en/news-room/fact-sheets/detail/healthy-diet.